

AlGaN Schottky Characteristics after Hybrid Photoenhanced Wet and Inductively Coupled Plasma Etching

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Abstract

AlGaN Schottky contact characteristics after hybrid photo-enhanced wet etching and Inductively Coupled Plasma (ICP) Etching is studied. AlGaN was grown by MOCVD on the sapphire substrate. KOH solution and 100 mW/cm² UV illumination by Hg arc lamp were used for photo-enhanced wet etching, and Cl₂/N₂ mixture was used for ICP etching. The Schottky metal used is Ni/Au (100nm/100nm) and the Ohmic metal used is Al (100nm).

Typical etching rates are 0.28nm/min and 265nm/min with roughness 0.6nm and 1.17nm for wet and dry etching respectively. The ICP etched surfaces are rougher and etched more rapidly when compared with wet-etch process. After ICP etching in 600 watt for 300sec, the Schottky diode has an ideality factor n=1.68, barrier height ϕ_B =0.883 eV. However, for the ICP etched sample followed by Photo-enhanced Wet Chemical Etching for 30mins, the sample has an ideality factor n=1.15, barrier height ϕ_B =1.108 eV (Fig1), and the breakdown voltage is recovered from 15V to 27V (Fig2). The study indicates that the wet etching can remove the damage caused by the ICP etching. And the hybrid dry/wet etching gives both high etching rates with low surface damages.

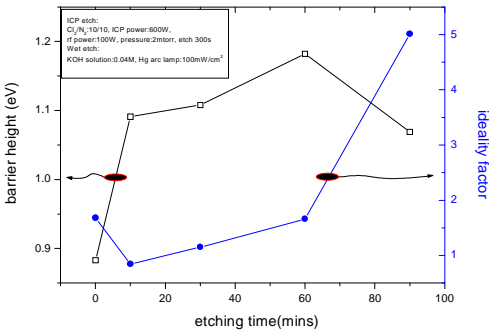


Figure 1. Schottky characterizations of hybrid etching with different PEC etching time.

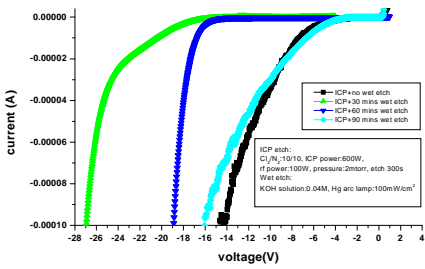


Figure . Breakdown voltage after hybrid etching with different PEC etching time.